SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1138.—Vol. XXVII.] LONDON, SATURDAY, JUNE 13, 1857. [WITH JOURNAL.] STAMPED ....SIXPENCE. UNSTAMPED..FIVEPENCE.

CORNISH MINE PHOTOGRAPHS—No. II.

BY GEORGE HENWOOD.

THE MINER'S FUNERAL.

"Hark! what means that distant deep melody, wafting o'er this wild moon?" exclaimed our tourists, one sultry Sunday afternoon, as they mused their walk over the down near Stithian's "church-town;" "and what means that black mass descending yonder hill side?" enquired they of some stalwart, neatly-dressed youths, who were wending their way at their utmost speed to join the approaching throng. "That! why, that be berrin—a miner's berrin.* Poor Nicholas Hill's—poor fella!—the best man in the mine: everybody liked en. He was killed last Thursday by a scale† falling, and was lashed‡ to atoms. We were forced to bring en home in a blankit. His own wife didn't know en: poor thing, 'tis a whish't§ day for her. We do all pity her: only married one year, and got one child. She've never spoke, nor bit, nor supped since. They say she'll break her heart; and if she do, his poor old mother will die too. 'Tis dreadful for her too; for her poor old man was killed up to the mine also, and it brings it all home fresh to her, like, poor old soul!"

On being requested, as the funeral was drawing near, these evidently sympathising youths slackened their speed, and continued their melancholy story, from which it appeared that Nicholas Hill was one of those good-natured spirits, active, intelligent, frank kind of fellows, so frequently to be met with among our mining population, who win the respect of their superiors and equals alike, neither he nor they knowing how or why, as he makes no effort to do so. But the miner is interrupted, and he can tell his story much more graphically and pathetically than our pen can indite.

"'Tis a bitter job for us all, sure enuff, I assure ye, gentlemen: all the three parishes is up about it. The mine owners have offered to pay for the berrin; Mister Michael Williams have sent her a sovereign; and Kappen Billy Martin (that's our mine kappen) have sent her two. Kappen Billy is always good to the sick and to widows. Nick, poor fellow, was underground in the 210 fathom level, when a scale of ground came away from the roof of the level, and crushed en as flat as a pancake. His comrade‖ was wheeling the trade (copper ore) out to shaft; and when he turned back, there was poor Nick—poor fellow!" (wiping his eyes)—as dead as a herring. When Tom Trezise (that's his comrade) comed to surface, he cuddent speak for five minutes, and then says he:—"Kappen Billy, Kappen Billy, how shall I tell Sarah (that's his wife, sir)? for—he's dead! he's killed!" 'Where—how—when?' shouts Kappen Billy. Kappen Billy is a good feeling man, gentlemen: without waiting to go to the counting-house, down he goes to the 210 like a shot, and takes men with en; but 'twas no use: the doctor was sent for, but 'twas all over. So the doctor goes to the preacher, and they both goes to poor Sarah. When they reached her door, she says, 'My God, my God, I know all you are come for—my Nick is killed!' took up her child, kissed it, and then fainted away. She've never spoke nor slept since. His poor dear old mother (Aunt Jane, we call her) bore it a deal better. The preacher and doctor did and said all they cud to comfort her; but, poor thing, there's no more comfort for her in this world."

By this time they had closed in with the procession, which they found consisting of several thousands of neatly, plainly clad persons of both sexes, the majority in respectable mourning, headed by the aforesaid methodist minister, who gave out a hymn by verses, which was admirably sung by the choirs of the different chapels in the neighbourhood. They, and they only, who have heard can appreciate the melody produced by so large a number of these skilful singers, and these formed the strains that had at first attracted their attention. After the singers (upwards of 80 male and female voices) came the good Kappen Billy, and the other agents of the mine (Tresavean), arranged in deep mourning. On either side walked the relays of bearers ¶ The distance was three miles to the church. After the body, came, or rather was carried, the unconscious form of the bereaved widow, who gazed listlessly on all around her. Reason had evidently lost its seat for the time; a deep settled melancholy not to be described—a sorrow and grief unutterable—had usurped its place. Well, indeed, might these unsophisticated sons of toil beautifully say, "There is no comfort for her in this world!" The two male companions who supported her were also almost overcome by the scene; when they beheld the old broken-down grandmother carrying the unconscious offspring, and bedewing its innocent smiling cheeks with her heart-wrung tears, their fortitude evidently gave way, and they wept too. A long string of relations walked in melancholy array, the rear being made up of thousands of miners and rustics, employed in the extensive works adjacent.

Our tourists involuntarily joined the procession, as it continued its melancholy parade and harmony, until it reached the churchyard. The knell, which had been tolling for some time before, now ceased; the preacher and singers filed off; the clergyman commenced the exquisitely beautiful ritual of the Church, when in an instant every male in that vast assembly was bareheaded, and all was solemnity itself, until it came to the thrilling sentence, "Earth to earth, dust to dust." The first rattle of the sod on the coffin startled the bereaved widow from her stupor, and, uttering a shriek that will never be forgotten, she went into a most distressing hysterical fit, in which state she was removed to the parsonage.

The ceremony being concluded, the good captain, preacher, agents, and a few friends, took their way home, not merely to talk of the merits and demerits of the deceased, or to recount the scenes of the day, but to try how to put the poor widow into some way of earning bread for herself and her child. The choirs repaired to the various public houses, and sung their hymns over again; the young people forgot their griefs, and solaced themselves with a stroll in the company of their companions; the children laughed, sported and jumped from hillocked grave to grave (in itself a moral lesson on the instability of life); the friends and sexton left the churchyard; and the funeral of poor Nicholas Hill, the Treseavean Miner, was over.

This is a true and not overwrought picture of these western barbarians, as they are sometimes reckoned. The characters are daguerreotyped from nature: not one is fictitious. We would ask, can the highest ranks, the most educated and polished circles of society—or do they—display finer feelings, more intense suffering, more sympathy, or genuine gratitude, than is attempted feebly to be depicted in this little description of the Cornish miner's character in its humbler phases? They are a fine set of worthy fellows, if well treated: they are kind to their fellows, generous to the distressed, and frequently display the highest qualities with which humanity is endowed.

* Berrin—a funeral. The churches in Cornwall being so far apart, and no hearses obtainable by the humbler classes, these assemblages of miners are absolutely necessary. Their funerals, therefore, if possible, take place on a Sunday. It should be observed that these men hold a peculiar sanctity for the dead—*De mortuis nil nisi bonum* is literally their feeling.

† Scale—a piece of loose detached ground falling. These accidents frequently happen without the slightest warning.

‡ Lashed—knocked or struck down.

§ Whish't—melancholy, wretched. A curious term, but very expressive when pronounced with a melancholy accent. Thus, a miserable wet day in Cornwall is termed "a whish't day."

‖ Comrade—the usual acceptation of this word does not quite come up to the Cornish, who mean something more than bare companion—it means bosom friend.

¶ Bearers—The coffin is always carried underhand; and in such long distances, frequent relays are absolutely necessary.

GOVERNMENT SCHOOL OF MINES.

The next lecture treated of the "Ores of Cadmium and Zinc," which had very similar characteristics. Cadmium was found in one mineral (Greenockite), which was only met with near Glasgow, in trap, or igneous rock, accompanied with phrenite and calcareous spar; it crystallises in the hexahedral form. A splendid specimen of this was shown and described. There was no native zinc, and in this it differed from several other minerals. Red oxide of zinc, or zinc ore, crystallises in the hexahedral system, and is found in irregular crystalline masses; its colour varies from a hyacinth to a blood red colour, and it contains about 80 per cent. of zinc. Hauy ascribes the colour to the presence of iron found in the several localities; it occurs, in considerable quantities, mixed with franklinite and calcareous spar at Franklin, Sterling, and Sparta, in New Jersey. Franklinite is a very distinctly crystallised mineral, the octahedron being its primary form; hardness, from 6 to 6·5, specific gravity a little above 5; it is of a deep black colour, has a brown streak, lustre not brilliant, but dull; before the blowpipe it gives a strong light, and throws off sparks. At Franklin it is produced in large quantities. Those who were in London at the time of the Great Exhibition of 1851 may have remembered the large block of it which was there. It has not hitherto been applied to any commercial purposes. He would now come to the most useful ore of zinc, that called blende; by the miners in Cornwall, black jack, or jack, this last being very convenient, as it had no reference to colour. In Derbyshire, on account of its similar appearance to lead, it was denominated mock ore, and often very serious disappointments had arisen from the mistakes thus made. It crystallises in the cubical system, and sometimes, from the variety of crystals, it is apt to give the student in crystallography some trouble. In the Alston Moor district it occurs massive, foliated, and granular; the cleavage is very distinct; the lustre varies from the resinous to the adamantine; its colours are several, but it generally bears a brownish tint. Some white blende has been found in the mines of Mr. Stephen Davey, in the parish of St. Agnes. In the zinc blende in some of the Prussian and Belgian districts cadmium is met with: before the blowpipe it decrepitates, and when strongly heated it emits vapours of zinc; but it is infusible even with the addition of borax. Much of the metallic zinc they are aware is derived from calamine; it is always important the best ores for commercial purposes should be selected, as it takes, in some instances, 12 tons of coal to produce one of zinc; and, therefore, it is necessary a due economy should be exercised; its localities are certain mines in North Wales; but it is principally in the Prussian states and in Belgium that it is successfully worked, and there it is an important point for the miners to obtain a good selected supply. It is associated with the copper beds in Cornwall; in the tin mines, not so much. Black jack likewise is met with in the lead mining districts of North Wales, connected with the presence of galena; and in the midland districts of Derbyshire, where it is so intimately associated with the lead that it requires mechanical processes to separate them. It is likewise met with in the Isle of Man, extensively diffused in the lead mines. On examination of the rocks, it would appear that zinc had been introduced by infiltration: it was sometimes discovered in the nodules of ironstone in the coal-fields. Mr. Warington Smyth then exhibited one of these, which he had himself taken out at Chesterfield. In the neighbourhood of Merthyr Tydvil it was likewise found. Zinc blende often contained silver, and several of the ores of England of that mineral have given, on assay, from 7 to 8 ozs. to the ton. They would remember that great attention had been excited by the discovery of gold near Dolgelly, in North Wales. He had seen some specimens of zinc from there, which were very beautiful, and where the gold was visible to the naked eye. He could not say whether these workings had answered commercially, or if there was gold through all the vein, or only in occasional specimens; if the latter was the case, in a mercantile point of view these would be valueless, and calculated to mislead. Calamine, or *lapis calaminaris*, has been known for centuries, and employed from the earliest times in the manufacture of brass. It was not known by the ancients to be a metal; but by them used as an earth to mix with the copper, and thereby form the mixed metal. Some specimens of that used by the Vieille Montagne Company were then shown; it occurs massive, botryoidal stalictic, pseudomorphic, and earthy; its hues are greyish or yellowish; but it has various shades of green and brown. In the carbonate of zinc there is always a little lead or cadmium present. One variety of carbonate of iron and zinc is considered a transition from the one metal to the other. In England, the Mendip Hills, which are in the carboniferous limestone, were long famous for the production of calamine; and Bristol was looked up to centuries ago as the head quarters of this mineral. That from Derbyshire supplied the Cheadle Works, which were so long celebrated for the fine brass wire they produced. In many places were calamine has been discovered, it has been thrown over the heap as rubbish, and this has been the case especially in Cornwall. Some of this mineral had been found at the Great St. George Mine, which, if it were down to 150, as it ought to be, instead of being at 75, some curious results would be arrived at. It was likewise met with at Fowey Consols, as well as at Alston Moor, from whence some of the finest specimens were obtained. In this country we annually require about 24,000 tons of foreign zinc; this was principally obtained from Belgium, Silesia, and Westphalia, where it is found in irregular deposits, like flats in this country. The Vieille Montagne Company may be said to have a monopoly, possessing, as they do, works in Baden, Silesia, Belgium, and other localities. The Nouvelle Montagne have not such advantages; nor do they employ such a number of labourers in the several grades. Calamine is likewise found in the Bannat of Temeswar, in Hungary; at Raibl and Bleiberg, in Carinthia; and in Jefferson County, in the United States. Sometimes it is tinted with green or blue, but this arises from incrustations of copper. Electric calamine, or siliceous oxide of zinc, occurs in druses and aggregated masses, mammillated, botryoidal, and other forms; crystals small; hardness, about 5; specific gravity less. In Cardiganshire there is a sort called cupreous. Willemite, silicate of zinc, is anhydrous; occurs near Aix-la-Chapelle. Sulphate of zinc is generally called orey calcite in Derbyshire. There is another variety of zinc of a pinkish red colour, called Kollegite, which has been analysed by a chemist of Frieberg, from who it is named; this is of a pinkish colour, very rare, and scarcely, except from the crystals, to be detected from arseniate of cobalt. This mineral is only found in Saxony. In his opinion, it was a matter of great importance, as the consumption of zinc was daily increasing, that some attention should be paid to our home deposits, as although, perhaps, we might not be able to manufacture so cheaply as was done at present abroad, though he saw no reason against it, yet we might be enabled to dispose of the ore, and render that which now was comparatively valueless, marketable.

The succeeding lecture was on the "Ores of Lead." The most common of them, and that which was largely used for commercial purposes, was galena. In its primary form it crystallises in the cube, and some of its shapes are very simple. In the cube it is very prevalent in the Alston Moor and Derbyshire districts: these have generally a dull aspect. The cubic octahedron and the rhombic dodecahedron are some of its varieties. Several good specimens illustrating the crystallography of galena had been obtained from the Tamar mines and from those in the vicinity of Callington and Liskeard; and some very beautiful ones were exhibited from Wheal Mary. Occasionally exceptional cases were to be found; in some there was a tendency to form a depression, as in those in salt—in others they were somewhat similar to the crystals of bismuth, while some were imbedded in a perfect form in the rock. One of these was shown from North Wales, where the galena, without any admixture of the vein, was embedded in a crystalline form in the country. In New Hampshire in the United States, the grain of the crystals was of a smaller character, while in those which had been brought from Nassau it was still finer; indeed, some of it carried this property to so great a degree that the fracture was similar to that of steel, and hence it was denominated steel-grained galena. It is a belief—though it is by no means a test to be relied on—that the smaller the grain the larger the proportion of silver it contains. The specific gravity of galena is 7·5; and this is an important fact to know, as this alone readily distinguishes it from several other minerals which at a superficial glance appear to have a similarity. Its great weight is some assistance to the miner in separating by dressing. The colour sometimes is tarnished; at others it has a greyish tint. In the carbonate of galena, in nearly every case, there is a small percentage of silver, but in the midland districts this is scarcely perceptible, so that the ores of lead raised there are not worth working for silver. Instead of speaking of percentage with regard to this, the quantity of ounces to the ton of silver-lead is generally reckoned. It is generally raised in England from veins in the carboniferous limestone, and in ancient times these were generally called metalliferous veins. Again, if we look at the geological group, we shall find those of South Wales are not so well defined as those in the north of the Principality. You pass then to Derbyshire, and then you leave them until past Leeds, then through Yorkshire up to Alston Moor, where there appears to be no prospect of diminution. These localities are all comparatively poor for silver: in Derbyshire the returns will be from 1 to 2 ozs. to the ton; Flintshire, 6 to 12 ozs.; and in the north of England, in some places, from 10 to 15 ozs. Crossing over to Ireland, not only are their repositories there very different, but the galena which has been very rich for a considerable period will occasionally be found to be cut out, and in some parts of the West of Ireland lead of the value of as much as from 120 to 150 ozs. of silver to the ton has been found. In Cornwall a considerable proportion of silver to the lead is found; the lodes there run in slate rocks and are more regular: they are well defined in Cardiganshire and Montgomeryshire. He had in a previous lecture alluded to zinc being found in the coal measures, and in the white ironstone of Dudley the galena could be seen; it was likewise met with in fossil wood and fossil shells. He would say nothing of its foreign localities, as they were tolerably well known. No tint of colour would enable them to detect the presence of silver in lead ores, although those containing that metal were generally distinguished by a blueness. In general, as he had stated, silver was found in galena of a small grain, yet in some localities it had been met with in large well defined crystals. A specimen from South Tamar, which was submerged last year, was shown from the West of Ireland, as well as one containing 35 ounces of silver to the ton from the mines Hiendala-enuna, at Guadalajara in Spain, with the discovery of which last so many romantic incidents are connected. All of these had a marked difference in their appearance and character, the peculiarity of each being pointed out by Mr. Warington Smyth. White lead ore, carbonate of lead, or cerusite, white lead, has been used for centuries. The crystallography of this mineral is very difficult, on account of their being so complex: they are noted as being peculiarly brittle, especially when fresh broken. They are usually macled; in general small, and their facets very numerous: the cross form is one that is commonly observed. It contains as much as 83·6 of the oxide of lead, and in many instances it occurs near the surface, in gossan, in radiating crystals of the ores. Some of the most beautiful of these are to be met with in Flintshire: sometimes they are to be found in beds of limestone in Derbyshire, but more generally in Flintshire, not far from the town of Mold. Lead vitriol, sulphate of lead, anglesite, so called from the island of Anglesey: hardness 3·3; specific gravity 6·31. A specimen was then exhibited, which had been brought from Wirksworth in Derbyshire; the colour was white, grey, or yellowish—frequently tinged blue or green by the presence of the oxide of copper. The lustre is similar to that of lead, but more resinous. The sulphate is of rarer occurrence than the carbonate, and where these two minerals occur together it would in some instances appear as if the sulphate had been changed to a carbonate in the gossans. Sometimes you will find carbonate of lead which appears corroded, and looking as if a calcareous mineral had been dipped in some acid. When broken the crystals inside are well developed. In the British Isles it has been found at Wicklow, and the Leadhills in Scotland, as well as at Alston Moor and other localities; abroad, it is best known in the Hartz Mines. Black lead ore, green lead ore, red lead ore, are several of the varieties. Pyromorphite, or phosphate of lead: this name has been given on account of its protean character; its crystals are of very simple forms, grouped occasionally in drusy cavities, sometimes having a botryoidal arrangement. Phosphate of lead, with a proportion of the chloride, is sometimes found: the lead will occasionally be replaced with lime. It is found in Nassau, but only occurs in places where galena has been found in considerable quantities; in turning over the burrows great accumulations of it are often discovered, and it is very difficult to say whence this is derived. In the south part of Derbyshire it is called greens; at Winster and Brassington large masses are found. Kampylite is another variety. Crocconite, or red lead ore: chemically this was the same as chromate of lead, and the principal locality from which this was derived was Beresdorf in Siberia, and in the Bannat. Molybdate of lead: this crystallises in the pyramidical form; sometimes it is called Carinthite. Several good specimens of this had been presented to the museum by Mr. Greenhough and Mr. Magendie. At Bleiberg it has a tendency to occur in tabular crystals. The chromic and molybdic acids are met in conjunction in some localities. Vandiate of lead: this is a most unsatisfactory mineral. At Wanlock Head it was found cemented together, and from the resemblance it bears to arseniate of lead, it was taken for that mineral. The last mineral he should mention was bournonite, so called from the Count de Bournon. The crystals are of considerable beauty. The Austrians call it radiers, the crystals being like a wheel; contains copper and antimony; appears to hold an intermediate place between lead and antimony. It occurs at Endellion in Cornwall, Kapnick in Transylvania, at Braunsdorf, with ores of silver, and in some of the Hungarian gold mines.

The following lecture treated of the "Ores of Iron." The uses of this metal were well known, and its ores were very diffused; it was found pure in the native, or combined with other metals, as well as with sulphur and oxygen, and in the form of oxides. It was not known whether native iron was of telluric origin, large masses of it had been found, how formed there had been several theories; their province, however, was not to deal with this; many of these had been seen to fall from the atmosphere. In general native meteoric iron was found alloyed with a considerable proportion of nickel, together with a small quantity of cobalt and olivine. Some had stated these had been shot out from the volcanoes in the moon; there was a great difference between meteorites and meteoric stones, the last being of a totally different nature. Some of these had been found with streams of gold and tin. Magnetic iron ore crystallises in the cubical form; this was a most important ore; by the aid of a glass its crystals can be easily distinguished, being in octahedrons and dodecahedrons; they are either embedded, detached to the surface, or, in fine masses of a granular character; hardness 5·5 to 6·5, specific gravity 6, colour iron black, with a dark streak of the same colour, and this fact should be especially noted; its character is strongly magnetic, it is not a protoxide of iron, but a combination of that with the sesqui-oxide, contains 73 per cent. of metallic iron, and some of these ores are so rich that they require to be treated with poorer metals. The principal supplies are obtained from Russia, Norway, and Sweden, where it is extensively used for the manufacture of steel; in Scandinavia there are various rich deposits, it generally occurs there in the slaty rocks, and with gneiss, accompanied with several curious minerals. There are various localities for it in England, but they have hitherto been neglected; it has been found at Falmouth, in the vicinity of St. Austell, and the eastern side of Dartmoor. Crossing to Ireland you come to the county of Wicklow, in the district which, at the latter end of the last century, excited so much attention for gold—it is met with there. There are several localities in Germany, and at the Isle of Elba; at Cape Calamita the rocks are so magnetic that when a vessel nears that promontory the compasses are turned round, reminding them somewhat of the story of Sinbad the Sailor. Specular iron, called by the French oligistic iron, occasionally acts feebly on the magnet, where it comes off by a touch of the finger it is called micaceous iron ore; a variety is called hematite from its being a blood red colour, the streak is reddish brown, crystallises in the rhomboidal form, fracture uneven, and sometimes conchoidal. Some good crystals are found in the neighbourhood of Botallack; specific gravity 5·2, hardness 5·5: the structure of this is different from hematite. This last mode of its occurrence has hitherto been neglected; some fine specimens of this were shown in the Great Exhibition of 1851. Sometimes it was found only as a colouring matter, then in the old and red sandstone, and occasionally coating beds of sand; in the mountain limestone it is found more or less cropping out, and this is the case in Derbyshire, and some of the Midland Counties: it is most prominent in the Whitehaven and Ulverston district, near Furness Abbey. There are but few localities for it in Cornwall and Devon; it is there in the granite hills about St. Austell, associated with tin and copper; this has been observed as well at Camborne, it is likewise found at Exmoor, and it is met with in the craters of Vesuvius, Stromboli, and Ascension Island, thrown up in a vaporised state, with a few crystals of specular iron intermixed. It is found more or less in every county, sometimes in pseudomorphous masses.

Goethite, so called in honour of the celebrated poet Goethe; hardness, from 5 to 5·5; specific gravity, 4; colour yellow, red, or dark brown; streak always brown; crystallises in the primary form; is so fibrous that the name "wood iron" has been sometimes given to it by the miners. At Restormel it occurs in very beautiful crystals; it is likewise met with at Exmoor and in the Westerwald, in Germany. Limonite or hydrous oxide of iron is found at Clifton, near Bristol, in large masses; of this description are the ores of Northamptonshire, as well as those of Wiltshire, which have so lately been worked, and excited some considerable attention. Several specimens of ores of various descriptions, from Carinthia, Styria, Spain, and Siegen were then shown and described, the crystallography being illustrated by diagrams and models. Iron pyrites was a sulphide of iron crystallised in the cubical form; at Wicklow, it contained so much sulphur that it was worked for that substance. There were varieties of this, such as marconite, liver ore, white iron, or cockscomb pyrites, from its crystals being aggregated in such a manner as to represent the comb of a cock. Very many of the accidents which occurred in collieries were traced to the decomposition of the pyrites in the coal, by which the sulphur getting heated would cause an explosion. They had often heard how, from this cause, on board ships, coals had taken fire. Arsenical iron pyrites, or mispeckel, as it was sometimes called, was of a tin white colour, it was good for the extraction of arsenic, and was sometimes so mixed with the tin ores that they were obliged to be burnt. It ought to be known, as it was sometimes very rich in silver, and, in some localities, was worked for that mineral.

The ores of iron, as he had previously stated, were most important; but, before opening any of these deposits for the purpose of working, the practical questions of cost of raising, transport, and reduction must be carefully and cautiously considered.

BRISTOL SCHOOL OF MINES.

The lecture on Monday was given by Mr. Mackworth, "On Coking and Coal Washing." After making some remarks on the composition of coal, the lecturer proceeded to show on what economic coking depended. Two things were to be regarded in the burning of coal—distillation and combustion. Properly speaking, we could not burn coal; when submitted to a high temperature, distillation took place, and certain gases were liberated, leaving coke behind. The process of manufacturing gas consisted in the distillation of coal; but when a superior kind of coke was required, as for railway and other purposes, it was necessary to effect a very gradual distillation by a minimum temperature necessary to the process, and by burning the gases eliminated, so as to retain as much carbon as possible in the shape of coke, carbonic acid, and carburetted being then given off, instead of carbonic oxide and carburetted hydrogen. Our terms bituminous and non-bituminous coal were calculated to lead to some amount of error, as there was in reality nothing specifically making this distinction; and as we advanced in acquaintance and utilisation of the mineral, it would be necessary to form a nomenclature. The terms adopted on the continent were caking, sinter, sand, and anthracite,—caking being the name given to the coal which fused together; sinter that which separated into pieces, and but imperfectly fused together; and sand to the form which the coal retained. The remark that the coking property of coal depended on the proportions of hydrogen and oxygen it contained, seemed to hold good with respect to three kinds of coal,—sand coal, the least coking, being represented by $C\,80+H\,44+O$; sinter, $C\,80+H\,64+O\,3$ to $O\,6$; coking, $C\,80+H\,120+O\,5$; but the kind termed high coking seemed to form an exception to this remark, as it was represented by $C\,80+H\,56+O\,3$; in this case there was a diminution of oxygen, and yet an increase in coking property. The clinkers in coking were formed by carbonate of lime forming a flux with iron pyrites; the sulphurous products caused waste of firebars, or any other iron with which they were brought in contact; it was the sulphur in the gas that tarnished plated goods in houses. Defects in the methods of coking consisted in an imperfect combustion of the volatile parts; the greatest quantity of tar was formed at a temperature of 700°, and the least quantity of gas given off; a higher temperature eliminated a greater quantity of gas, to the destruction of much of the coke. The great difference between other coke-ovens and that of the lecturer's was, the air being carried down through the coal in the latter, and up-in the former. The point gained was that of carrying the bituminous tarry products from successive layers of newly supplied coal down through the coke of high temperature, and so securing a portion of their carbon, which would otherwise have been volatilised, thus saving a percentage considerably greater than that by other methods. It was of great importance that all the earthy and stony impurities were removed from the coal prior to coking. After the introduction of a French patent into England for washing coal, by Mr. Morrison, the coal of the old heaps of the north of England was converted into coke, and used to run express trains with. Much of the coal left as waste under ground might be brought to bank and washed at a total cost of 2s. 6d. per ton, and could then be sold at 5s. per ton. Coal was washed by its being kept agitated in water, so that its impurities being of greater specific gravity than the coal itself, sunk to the bottom, whilst the coal was found at the top. In the method of washing by a plunger at the end of a box, the water was not only forced up, but pulled down, through the coal, thus tending to mix the heavier particles of coal with the shale. By the lecturer's recent invention, this effect was obviated in the use of a centrifugal pump, by which a continuous upward current was maintained in a conical hopper, down through which the shale and stony impurities fell into a receiver, whilst the coal was scooped over the top of the hopper into a conductor. Mr. Mackworth exhibited various interesting and instructing models, showing defects in present washing machines and coke ovens, and how such might be remedied.

ROCKS AND MINERAL DEPOSITS OF NAMAQUALAND.—No. VII.

Several bands of basalt, (amygdaloid) porphyritic trap, and red porphyry occur on the south-west side of that mountain range. In one variety of rock, crystals of light brownish felspar are embedded in a fine granular dark base; in another, crystals and fragments of crystals of a reddish felspar, being perfectly similar to those found in the surrounding parent rock, are embedded in a light yellowish-grey base (a band of the latter is seen on the southern extremity of the Kabous basin). There occur in both crystals with sharp, well-defined angles and sides, but in the darker variety fragments of a roundish, globular, and almond-like shape, appear to predominate, and the base of the rock that contained felspar crystals was more calcareous than that of the amygdaloid basalt, which contained crystals of calcspar. An investigation of the relative position (to surrounding minerals) and degree of development of the different varieties of felspar (including the calcareous) might lead to some very interesting results, but would make this paper too bulky.

A band of dark amygdaloidal basalt traverses the upper part of the valley of N'Omies, and is, like all other rocks in that locality, of a highly exfoliated (schistose) structure, and traversed by numerous veins, veinlets, and patches of a light reddish carbonate of lime on a higher level, but massive and dense, and containing numerous nodules of carbonate of lime on the bottom of valleys. Chloritic schist occurs invariably in the vicinity of such amygdaloid trap and basalt, traces of chlorite being very frequently met with in the very mass of such rocks.

It is assumed that such amygdaloidal rocks were produced by heat, being heaved up from below; that, when in a state of fusion, numerous bubbles of gas existed within their mass; that, when the rock had got colder and denser, those gasses found means of escape, and carbonate of lime was infiltred by the action of water into such cavities. This hypothesis might account for the formation of roundish, globular, and almond-like masses of carbonate of lime, but it would be very difficult thus to explain the presence of angular crystals, and angular fragments of crystals, of carbonate of lime, and of felspar, agates, and other silicious minerals. It is said that basalt was heaved up under a great pressure, having been heaved up on the bottom of the sea, and that for that reason, and on account of these peculiar conditions being wanting, no basalt could be produced by existing volcanoes: no trace, however, is found near Kabous, Zabisis, and other localities, and many other places besides in the world where basalt occurs, of any deposit indicative of the presence of the sea at former periods. Vertical or horizontal dislocations and heaves are invariably found near a band of basalt; but whether a thin band of basalt is the cause of such displacement of vast mountain masses, or whether such displacement gave the first impulse to the formation of such a vein of basalt, is a question. The fresh and powerful electric life which is traceable everywhere in primary rocks, and which is a principal agent in the formation of metallic lodes, quartz, and other veins and bands, has most likely been active in the formation of such veins of basalt too.

To the east from that band of amygdaloid basalt (in the upper valley of N'Omies), but on a higher level, and separated from the basalt by a broad band of talc and gneissose schist, occurs a peculiar rock—viz., a thin, perfectly horizontal layer of a dark fine-grained calcareous rock, containing numerous small pyrites, and having a perfectly slaty structure, but of a hard crystalline texture, and with not a trace of fossils. To the north-north-east from it there is towering a bulky mass of horizontal quartz rock (Table Mountain sandstone), leading almost to the supposition that this thin seam of calcareous rock must have been deposited during the period in which that bulk of quartz rock which at one time did evidently cover this spot, as well as all the surrounding part, was being worn away by denudation. In the same vicinity is noticed a meridional band of a reddish, highly silicious granite, with pyrites imbedded in its mass. Numerous observations lead me to consider the occurrence of pyrites in a rock to be as much indicative of the powerful changing influence of the gradually but continually active chemical agents of nature, as the occurrence of native sulphur (being the result of the intense heat of volcanoes acting upon sulphurous minerals) is indicative of the volcanic origin of a rock.

In the larger valleys or basins, and more especially within the Kodas basin, there occurs a stratum, or rather stratum-like deposit, of an apparently very recent rock, being a conglomerate, in which fragments of all the surrounding rocks are cemented together by a light yellowish grey marly (that is, argillaceous and calcareous) paste. This layer is thickest on lower levels, and more especially close to the beds of the periodical rivers, and appears to get thinner when ascending towards and entering the tributary valleys of the basin. It greatest thickness, however, never exceeded 25 feet.

Commencing to examine that rock close to such a river bed, where it is most bulky, we notice that the further we go away from that river bed the less we notice of it, till at last we find it to change, by a gradual transition, into sand and rubbish. On ascending any of the ravines towards the higher rocky mountains, we notice (especially on the east side of the basin) the rock frequently, and especially in the water-courses, coated by a crust of the same whitish marly substance, showing that that substance must have been deposited by water. Moreover, if we take any portion of the sand which covers the greater portion of the valleys, and pour water upon it, we obtain a similar paste as sediment; and from all it would appear that that conglomerate was created chiefly by the water of those periodical rivers and rivulets rushing down with great vehemence (which is a characteristic feature of the South African rivers), the force of the muddy water pushing sand, pebbles, &c., before it, and depositing the same on either side of it, at any spot where it met with obstacles, and where its force was inadequate to carry the same further; and the dust and other fine soluble particles having been taken up by the water would, on the water drying up again, form a paste, by which those pebbles, sand, &c., would be cemented together, and subsequently form a hard mass; hence that conglomerate is most bulky close to, on either side of, the periodical rivers and rivulets, and in spots where the water, meeting with obstacles in front, did cover a broad tract of ground; and hence the same conglomerate is changing gradually into sand, &c., towards such spots which could not be reached by the water. As all the larger animals, gazelles, hares, &c., being warned by their instinct of the approaching danger, would take to the higher levels before such a catastrophe of the river "coming down" takes place, it is not likely that fossils of such should be met with in that conglomerate. JULIUS.

ERRATA.—In No. VI., line 18, for "western part of the colony," read, *south-western* part; line 43, for "contact," read, *influence*; line 45, for "bed rocks," read, *bed-like*.

TREATMENT OF GOLD QUARTZ.

The works of the Chancellorsville Freehold Gold Mining Company have now assumed a more important aspect, as it turns out to be the establishment of an operative quartz crushing company, with extensive and efficient apparatus. The works of the Chancellorsville Gold and Silver Reduction Company are situated at Frodsham-bridge, on the banks of the River Weaver. They are very eligibly situated, and have a commodious wharf on the river margin, at which, with 16 ft. of water, at the height of spring, and a proportionate depth at neap tides, there is a ready means of transit to and fro. It is in close proximity to an abundant supply of coal, and labour is cheap in the vicinity.

The company has now been in existence for a considerable length of time, and for months past active operations have been going on under the superintendence of Mr. Josiah Harris, the manager and engineer of the company, in the construction of apparatus of different kinds, suited to the various processes employed in the successful reduction of auriferous and argentine ores. These having been so far completed as to admit of a fully arranged experiment being made: it was fixed for Saturday last, and it took place under the direction of Mr. Harris and his assistants There were also present—Professor Henry, F.R.S.; Mr. Geo. F. Ansell, of the Royal Mint; Mr. Pemberton; Mr. Staunton; Mr. Cooke (Powell and Cooke); Mr. J. B. Balcombe, and several other extensive shareholders; the directors; Mr. Trotter (the secretary); and a number of gentlemen who take an interest in the proceedings and success of the undertaking.

Mr. Harris explained that at the present time the company was mainly dependent for the supply of the auriferous quartz from Chancellorsville, about 24 miles from Fredericksburg, in Virginia, U.S., North America. The ores, he said, are brought over in barrels as ballast, and laid down at the works. This quartz he stated to be very rich in metalliferous compounds; among these he laid particular stress on the quantity of sulphur, which, in the shape of "flour of brimstone," can be separated from the ore, and secured in the course of reduction. The supply of quartz from Chancellorsville he represented as being all but inexhaustible, and so easily procured that it can be had in any quantity. Notwithstanding the very large supplies which may be obtained from there, he expected at no distant day to see the rich gold quartz of Australia brought to Frodsham-bridge for reduction. Indeed, he said that arrangements had been all but completed with a very extensive Australian shipping house in Liverpool for the delivery of 50 tons per month, and he doubted not that other houses would follow the example set by the one to which he alluded. Nearer home, however, he maintained that the supply is as rich as that in any portion of the world, in our own metalliferous mountain ranges of Wales, in the Dolgelly district. The masses of auriferous quartz to be found there he represented as enormous, and exhibited specimens which he had himself collected, showing gold in considerable quantities. He said, so far as his experience could be depended on—and he had had considerable experience—he looked on Merionethshire as more rich in the precious metals than any spot of equal area in Her Majesty's dominions. So extensive, indeed, were the supplies of gold-yielding quartz in that county that he calculated with certainty on being furnished with 1000 tons monthly from Wales, at a rate of charge not exceeding 1*l.* per ton, delivered at the works. The Welsh ores he represented as particularly rich in silver and sulphur, so rich, indeed, that by carefully collecting the sulphur he anticipated realising from it alone as much revenue as would nearly pay for the quartz, and the cost of its reduction.

Mr. Harris next proceeded to show and explain the different processes through which the ores pass, and the apparatus employed in their reduction. The ore, after being unpacked from the barrels in which it is brought from the mines, is broken into pieces about the size of second bottoming for macadamised roads. When thus broken it is thrown into a calcining furnace, where it is subjected to a very high temperature for about four hours. At the end of this time it has become much more brittle than it was, and after being cooled it is removed to the vicinity of the stamps. Those employed at the present time consist of twelve heads of Cornish stamps, each weighing 7 cwts., and are allowed to fall 9 in. The lifting shaft makes twelve revolutions per minute, thus keeping up a rapid series of heavy blows on the material placed below them. The quartz by this process is reduced to granulations similar in size to coarse sand. When so pounded, the stream of water, which is constantly poured throughout the stamping boxes, washes the matter away into slime pits, the water passing away in a clear condition.

The process of stamping having thus been completed, the whole is taken out of the pits. In this state it is removed to the "concussion," or the "shaking table," as it is called. Here it is thrown into a wire-gauze cylinder, revolving at an angle of 30° to the horizon, and is treated with the action of a stream of water, which washes out the gritty sand, and spreads it over an inclined plane, from which it drops in a semi-liquid state upon a long table placed nearly horizontally, but which by the action of the machinery is every two or three seconds raised considerably at the back or upper end, being, at the same time, made to fall with considerable violence. In this process the heavy metallic particles fall to the bottom; the silicious or quartzy particles being lighter, are gradually carrried by the action of the water, and the continuous concussion of the table, further and further down its surface, till it is at length washed entirely off the board, by which time it is completely denuded of every metalliferous particle. The metalliferous portions being concentrated, are carefully removed, and placed in a reverberatory furnace, where for four hours it is subjected to a very high temperature. In this furnace everything which can be volatilised, including the sulphur which it contains, is drawn off in the shape of vapour.

By this process the sulphur is collected. The fumes are made to pass through a flue 120 ft. long, in the course of which it is brought into contact with water, at different points, by which the sulphurous fumes are condensed and thrown down in the shape of flour of brimstone, an article the market value of which at present Mr. Harris states to be about 8*l.* per ton. The doors of the furnace are kept carefully closed to prevent any of the gold, during the process of stirring, being carried off mechanically. After this second calcinatory process has been completed, the mass has been rendered much more friable, and it is then what is denominated the auriferous powder. This powder is removed to be more finely ground, in an apparatus which consists of a rapidly revolving mill, through which the auriferous powder is passed by a stream of water, and by the trituration it there meets with it is ground into an impalpable paste. The water in which it is mixed is next made to pass over a flat table with a slight inclination from the horizontal, over which are continually passed ranges of magnets—250 in number—which dips into the stream in its course and takes all the particles of arsenuret of iron which may be in the mineral. The magnets are drawn backwards by two endless chains which rub the magnets against a revolving brush, and thus sweep off the iron which may adhere to them. From the table referred to, the fluid passes, by two tubes, into a crucible-shaped amalgamator, having 8 in. in depth of mercury at the bottom. The mercury is kept continually stirred by four perforated vertical plates revolving on a spindle, and driven by the machinery. By this means every portion of the crushed ore is brought into contact with the mercury, and every auriferous particle is taken up by it. To stimulate the action of the mercury it is heated by steam. On the completion of this operation the mercury is drawn off and distilled, and arrangements have been made to distil the mercury by super-heated steam, instead of by fire, and the retort has been so constructed that, if desirable, a months' working can be passed through without opening the lid.

Some portions of the process, as above described, will, it is believed, be subject to alteration and improvement, particularly that carried on by the rotatory pulverisers, which it has been discovered can be effected more cheaply, with greater efficiency and celerity, by the common millstones in use at rice or Indian corn mills, Mr. Rigby, of the Frodsham-bridge Mills, having fine-ground a considerable portion with a pair of stones without injuring them more than would have been done by as much Indian corn.

All these operations were minutely examined by the gentlemen assembled. The result was that 1 oz. 7 dwts. 7 grs. of gold were obtained from 1 ton of material. Nothing can be more satisfactory than such a result. The fact is one which will, if carried out, affect the production of gold more seriously than the discoveries of Australia or California.

TO INTENDING TOURISTS THROUGH CORNWALL.

[*Continued from Mining Journal of May* 16.]

We continue our ramble from Marazion, and by keeping on the beach we may observe and pass over the lodes of the Mount's Bay Consols, the engine-house of which stands on the very edge of the low cliff; this is a very prettily laid out plant. We then come to Trenow Consols, once rich for tin and copper; the mine has been recently wrought, and at one time promised brilliant success; miners in the locality say it has not been half tried even now. Wheal Neptune, formerly a splendid mine, lies east; the main lodes of this mine may be easily detected, stretching away west, towards St. Michael's Mount. Near this is the Tolvadden Mine, on the same series of lodes; indeed, the main lode of the Neptune constitutes the Tolvadden Mine. In this neighbourhood are several tin and copper mines, Perran Consols, St. Aubyn and Grylls, Trannack and Boscean, Kenneggy, and others. But to confine our journey to the cliffs, as we proposed; in going south, as our course now is, we must observe the strata alternate from greenstone to killas very frequently, the lodes traversing both of these rocks. There is nothing very particular to be mentioned, until we come to about a quarter of a mile of Menadue Point, easily recognised by an islet or rock off it, distant about a quarter of a mile. A raised beach must be noticed in the cliff, about 30 ft. above the present level of the sea; the pebbles will be found to consist principally of quartz and other silicious stones, with greenstone and hornblendic porphyry, very much attrited; the depth of the layer shows a long deposit of shingle, as well as a finer sand. It appears the level of the sea, at some distant era, was much higher than at present, or that the cliff has been much upheaved. Passing the Menadue Point, we arrive at the sands of Perran Uthnoe, on the southern point of which the raised beaches must be again particularly examined. The cliffs hence to Cuddan Point are very precipitous; they consist of clay-slate, and cannot be examined without considerable difficulty; nothing worth the trouble has yet been discovered. The gentleman's residence in the lawn just above these cliffs is Acton Castle, the seat of Mr. Thomas Field, the eminent mine agent. The next place to be explored is Prussia Cove, where a very large lode may be plainly seen; this lode bears north and by west; it is a caunter lode, and is supposed to be the one that enriches the east and west lodes of the mines above referred to. We must now cross overland to Sydney Cove, as the coast is rocky, and it is dangerous to attempt going round the Point. At Sydney Cove, a huge caunter lode or cross-course will be seen, as well as many other lodes, which have formed a junction; at such places, the richest mines are usually found. A mine was formerly wrought here, with considerable success; differences in their councils and squabbling broke up the company. It is now about to be reworked, under more favourable auspices, and is said by competent judges to be one of the best speculations in Cornwall. We now pass on to Pra sands, the scene of many a melancholy catastrophe; this place was formerly notorious for wreckers, but such times are happily now unknown; however, it formerly passed as a proverb, when a gale of wind was blowing, to say—

"Get hatchet and saa (saw),
And away to Pra."

On the southernmost point at this place, after walking over the sands, the continuation of the Sydney Cove lode may be distinctly seen, and copper ore obtained; it will be found in a direct line, trending towards the Trewavas mine on the south; both these mines are on the same main lode. Trewavas was worked by the late Capt. Thomas Teague with considerable profit, and most glowing expectations were formed, but at his death it was abandoned; the headland is called Trewavas Head, just around which is the old engine-house, on the point of the cliff. Granite veins traversing granite may be here observed, if the explorer will venture down the precipitous cliff; having examined them further west, it is hardly worth the trouble. The Trewavas Mine is exactly at the junction of the granite and killas, an isolated patch of which occurs in this mine sett, the killas being wholly surrounded by granite. About half a mile east, granitic veins may be seen traversing the slate, and being great curiosities they should by all means be explored most carefully. Near these, to the east, are some more raised beaches, of a similar character to those before described. The cliffs now become more bold, and utterly impassable until Porthleven Point be passed; here a marked difference in the clay-slate will be observed; the killas on the south of the ravine, in which the village is built, is congenial for lead formations. Some years since, some good lead mines were partially worked in this neighbourhood; the lead was rich in the produce of silver, but the low price of lead at the time (about half the present) led to their desertion. Near the Loe Bar, a long beach of shingle that divides an ornamental sheet of fresh water, on the grounds of the seat of the Rev. Canon Rogers, from the sea, a mine called Penrose, and a little further inland the Saturn Mine, returned considerable quantities of good lead and silver ore.

Porthleven is a place of considerable traffic for mines in the neighbourhood, it being the port for the Great Wheal Vor Tin Mine, which lies north by west of this place. Crossing the shingle beach, we must go over the down called Goonbilly (which is celebrated for a peculiar heath that grows on it, and extends many miles east) to Gunwalloe, a famous fishing village, round which blown sand will be found for a short distance. Nothing more worth waiting for can be seen here; we must, therefore, again keep the edge of the cliff, as there is no passing at the base until we come to Pollurian or Bellurian Cove, where a junction of the killas with the serpentine series takes place; the rocks here are much disturbed, and form a conglomerate kind of serpentine. Near a small rivulet, at the place where you can descend to the sands, the only safe one, the clay-slate may be seen dipping south most distinctly. A few fathoms south, the great Bellurian east and west lode may be seen, standing many fathoms high in the cliffs, with a peculiar yellow ochery gossan, many yards wide, and very friable; the lode hardens and decreases in size as it descends; the walls are well defined. At the shore, the lode is from 8 to 12 feet wide; the hard stones on the upper part are the capels of the lode. Beneath the gossan, the lode itself will be found to be a mixture of no ordinary kind, killas, felspar, white iron, mundic, carbonate of lime, and copper ore. By removing the sand at low water, about 50 or 60 fms. west, stones of rich yellow ore may be broken. South of this, only about 12 fms., is another copper lode, of a totally different character; the gossan of this lode is compact, and has more the appearance of igneous action than the Bellurian or any other of the numerous lodes to be seen here. This place must be visited at low water, when the sight is well worth seeing, the boulders of conglomerate presenting the most beautiful specimens of serpentine, white and green—white, green, and red—green, red, and black—in every possible variety and figure. Truly splendid examples may be obtained.

Strict examination of the rocks on the shore, near the south wall of the Bellurian lode, will lead to the detection of the slickenslides phenomena, not often to be seen at the surface. On the south part of this bay, near an engine-house which was erected a few years since, when this extraordinary spot was about to have been mined, may be seen three or four huge elvan courses, running nearly north-west and south-east; they are decayed elvans, very soft, and of a light yellow colour, tinged in places with green and red; they may be examined by descending a miners' path, near the counting-house, but extreme care must be exercised, as the path is very rugged, and the cliff 200 ft. high; further south, and near the Point, will be seen the great north and south lode, that intersects all the before mentioned lodes; about 120 fms. from the cliffs the lode is highly metalliferous; though it does not exactly dial off to be the Sydney and Trewavas lode, I am of opinion it is the same, heaved by this mighty convulsion, that disordered this ground so much. To the east by south from this place, at about a mile distance, stands the Trenance Copper Mine, from which the largest specimen of native copper ever found in Cornwall was obtained; it was exhibited in the Great Exhibition of 1851, and part of it now graces the collection in Jermyn-street, St. James's, London; many other fine specimens of pure copper have been found, but in a commercial point of view the mine did not answer, and was consequently abandoned. These rich deposits at the surface must have had an origin somewhere; the disturbed confused state of the strata before described would seem to point out these great lodes as the sources; however, that is a speculative enquiry, and we have only to do with facts. This is one of the most inter-

esting and instructive spots in the whole of our proposed journey, and must therefore be paid attention to with more than ordinary zeal; as time to do this will be requisite, we will repair to Mullion Cove, by crossing over the brow of the cliff; Mullion is a place celebrated as a coast-guard station, a fishing cove, with a good establishment of nets, boats, &c., for the capture of that essentially Cornish fish, the pilchard. As humble though comfortable lodgings may be obtained here, we will, after a hard day's walk and scramble, take a little rest and wet our whistle, to be enabled to pursue our route on the morrow.

MEMS. OF MINES AND MINERS—No. VII.

It is not the purpose of these papers to extol or laud unduly the past or present race of persons engaged in this profession, but show in their true characters those to whom these prodigious interests are entrusted, and the results when persevered in by qualified parties. Formerly the mines of Devon and Cornwall were merely local matters, and the adventure confined to the locality. The demand for metals, consequent on our extended trade and commerce, required a greatly increased produce of mineral; this necessitated more vigorous action, and capital had to be raised. The fact of immense and rapid fortunes having been made by a few who had adventured with some of the western miners created a mania and its consequences—a host of sham speculations, deceptive schemes, and hopeless swindles. Be it remembered, the majority of these were concocted not by miners, but by others, who threw the onus on the miners; the poor dupes naturally supposing the mines had been the cause of their loss, railed vehemently against everything bearing the name of speculation, as being "the baseless fabric of a vision." The object of these papers is to dispel so foul and unworthy an idea; to prove to demonstration there have been, are, and, therefore, the presumption is there will be, employed in these pursuits a set of men who do honour to the profession in every stage of life, from the miner to the adventurer, adding fame to their country, wealth to their kingdom, and comfort to their fellow-man. To detail the enormous wealth of many who have realised fortunes, either by adventure or by the produce extracted from their lands, would appear fabulous. "Ask Fame and she will tell you." The hills would echo to the sound of her trumpet—Londonderry, Palmerston, Devonshire, Beaumont, Durham, Crawshay, Hill, Guest, &c. But to return to our "Mems.," and stick to the miners, and begin again; having given some names celebrated for their abilities, some for peculiarities of character, and some for eccentricities, we now come to some who have been and are celebrated for their success in these pursuits.

MICHAEL WILLIAMS (Scorrier House) was one of those Cornish miners who, by persevering industry and attention, backed by unswerving confidence, worked the Great Scorrier Mine, near Chacewater, as well as several other neighbouring mines, such as North Downs, &c. The vast heaps of rubbish drawn out of the mines still to be seen in barren sterility on the equally barren down between Chacewater and Redruth testify to the extent of the old workings. Hundreds of persons were employed at these mines, and on them were erected some of the first steam-engines ever seen in Cornwall—probably some of the first ever constructed. During the wars of Napoleon, when coin in this country became absolutely scarce, and when local tokens were permitted as payment, Mr. Williams issued the famous Scorrier House penny, the full ounce of copper. These pence are now very scarce, the high price of copper soon after their issue causing them to disappear rapidly. On the obverse was stamped the quaint old engine-house and a whim; on the reverse, three fish, blocks of tin, and ingots of copper, surrounded by the motto, "Success to the Cornish Mines." Mr. Williams died a few years since, bequeathing a colossal fortune to his descendants, who, by their own adventure, had also realised vast sums in mining, and are now the head of the metal world as smelters and refiners; their wealth is fabulous, rivalling that of potentates and nabobs.

Dr. DANIELL (of Trelissick) was one of the lucky men who participated with the late Mr. Lemon, the ancestor of Sir Charles, in the discovery at the Great Towan Mine (St. Agnes). This is a striking instance of indomitable perseverance; they had worked this mine many years, and at such a great cost, that the Doctor's means were exhausted, or, perhaps, straitened most seriously. The indications at the mine had long been all that could be desired except the course of ore (mining was not so well understood then as now; no such occurrence could take place at present), when by mere chance the true vein was discovered, from which hundreds of thousands of pounds' worth of copper were raised in a short time. The ore was chiefly of that variety called black ore, and easily broken; it is said to have been taken on tribute of a farthing in the pound. The mine returned a guinea a minute profit for years. The stories connected with this mine are numerous, and need not be introduced. Suffice it to say, Dr. Daniell realised a splendid fortune, and built a beautiful mansion on a fine estate, called Trelissick, situated on the picturesque banks of the Truro river. Dr. Daniell has been dead some years.

Capt. THOMAS TEAGUE (of Redruth) presents a remarkable instance of what untiring perseverance and a firm reliance on sound experience will accomplish. This gentleman was, indeed, one of the fortunate shareholders in the great Tresavean Mine. He previously had the management of several others, and had been an extensive shareholder in them with chequered success. At length this extraordinary mine fell into his possession; they had long worked it at heavy expenses, wearing out the adventurers by continuous calls, and nothing but kindly appearances presenting themselves, excepting now and then a beautiful "slocking stone" (the author has seen some magnificent specimens of crystallised grey ore from Tresavean, found before the great lode was cut). It was eventually decided to call a meeting, to debate on stopping or working the mine. Many gave up their shares, determined not to further risk their money, or to render themselves liable. Capt. Teague having faith in his knowledge and experience, begged them to go on for a month or two more—only a little month! He had confidence, and would most certainly do so, even were it to cost him his last shilling; he knew there must be the deposit somewhere, or the appearances witnessed could not show themselves. Many who hesitated, fortunately for themselves, took courage by his example, and did not sign off. Before many weeks had elapsed the expected vein was cut, and the mine proved to be one of the richest the world ever saw. The profits for 18 years amounted to nearly 500,000*l.*, exclusive of 55,000*l.* paid for lord's dues. Hear ye that, O landlords, and encourage miners! The whole estate, previous to this discovery, would not fetch more than 3000*l.* This mine is still working, and is down the the tremendous depth of 310 fms. The shares are 96 in number, and still paying dividends. Capt. Teague also worked the Trewavas and other mines, and was a bold and liberal adventurer. He met his just reward; he realised an ample fortune, and died regretted by all who knew him.

COLLIERY WORKINGS—THE SAFETY-LAMP.

At the Manchester Geological Society meeting, on Tuesday, Mr. E. W. BINNEY (the Chairman) read a paper on "The Mixed Use of Davy Lamps and Naked Lights in Coal Mines." He said he need not deprecate the use of lamps as a substitute for thorough and efficient ventilation, for no coal proprietor who valued his own property or the lives of his workmen would so regard it. The first point to be attended to in a mine which gave out light carburetted hydrogen gas was to remove that gas as soon as possible, by good ventilation. When that was done the lamp should be employed as a precaution against any stoppage in the ventilation by falls of roof, or derangement of air courses, or by the sudden liberation of gas from the roof or other part of the mine. Lamps were frequently used on the opening of a seam of coal, in driving fast places, and when pillars were being robbed or worked back, whilst naked lights were in use over the greater part of the mine; this was the dangerous admixture of lamps and lights that should be openly condemned. The presence of the explosive gas in mines could never be detected by the senses, and of the nature of the gas clever practical men were very ignorant. This ignorance of the origin and properties of fire-damp was in his opinion the chief cause of explosions in coal mines. The mixed use of lamps and candles in a mine where fire damp was known to be in any part of the workings, was both reckless and dangerous. The continual workings gradually made the mines deeper, and consequently more subject to fire-damp; and in proportion as this occurred the number of explosions would increase, unless there were provided a more highly educated, thoroughly intelligent, and well-paid staff of officers, and a body of educated, steady, and disciplined working miners.—Mr. LIVESEY: And half a crown a ton more on the price. (Laughter.)—A conversation then ensued, in the course of which Mr. HIGSON said the Davy lamps should be more generally used than they are at present in deep workings. He also stated that one of the owners of the Lund Hill Colliery assured him last week that their loss would not be less than 15,000*l.* by the explosion.—Mr. GILROY said it was impossible in the district from which he came, even with the best ventilation, to work safely without safety-lamps. In the mines under his management, he never allowed an underlooker or fireman under any circumstances to take off the top of his lamp.—Mr. LIVESEY said he was decidedly against the opinion that it was necessary to use safety-lamps in any mine. As an instrument for general working it was not wanted, and was only required in some districts which had lain dead, or when a new road was being cut. —The CHAIRMAN remarked that it was manifestly desirable to make the assurance of safety doubly sure, by using the lamp.—Mr. HEWLETT, mining engineer at Ince Hall, said the safety-lamps should be used in working off pillars.—The CHAIRMAN said they frequently heard remarks about the carelessness of colliers; he did not agree with them. When he had engaged a collier to go to a part of a mine where fire damp was known to be, in order to fill a bottle with the gas, he never could persuade one even to take a lamp.

Mr. BINNEY also exhibited a lamp, which had been left with him for the opinion of the members of the Society to be taken upon it. It was similar to the Davy lamp, with the addition of a glass globe round the gauze.—Mr. THOMAS LIVESEY said the glass would obstruct the light, and not make the lamp any safer.—The CHAIRMAN remarked that the lamp would go out if the atmosphere was not very pure. He regretted that he had not been able to light the lamp, and therefore it had not been properly tried.—Mr. HIGSON, the Government Inspector of Mines, said he considered that it would not give so good a light as an ordinary Davy, nor would it be so safe.

IMPROVEMENTS FOR FACILITATING SUBMARINE OPERATIONS.

On Tuesday, a numerous party of engineers and scientific men left the Fenchurch-street terminus of the Blackwall Railway by special train, for the purpose of witnessing the operations, at the Victoria Docks, of the "Nautilus" diving apparatus, which has for some time past been doing actual work for the dock company itself, with a saving of time and money to an extent that must, we think, bring the machine into very general, if not universal, requirement for submarine work. We learn from what transpired at a very elegant luncheon, given after the experiments, that the directors of the docks complied some time since with a request that the Nautilus should be "put in harness" upon the works going on in the basin, and that the machine has shown, as will be seen from the testimony of the company's superintendent, and referred to in the speech of Mr. Robert Stephenson, a vast superiority over the common diving bell.

Having steamed round these magnificent docks, we found the Nautilus floating on the water, connected by small hose with the machinery contained on board a barge, or scow, floating near. The Nautilus is nearly cylindrical, with a spherical top. On board the barge was a steam boiler, a cylinder, or reservoir, and a condensing, or air-pump, of novel construction, the main feature of its improvements being its refrigeration or absorption of the latent heat evolved by the rapid condensation of air at high density. A description of the details of the machine would require too much space. The general principles involved in its working are, that while at rest and floating at the surface a cover on the top is raised, and on entering a chamber and closing the top again water is admitted through a pipe into two chambers on either side of the machine. The assumption of weight, by the entrance of water, destroys the buoyancy incident to the displacement of the water by the mass itself. As soon as a sufficient quantity of water or ballast is assumed, the machine descends below the surface, until the bottom is reached. While descending, air is drawn to the chamber in which the men are situated through the hose from the reservoir in the barge. As soon as the air thus drawn is sufficiently condensed to resist the entrance of water, a cover to the bottom is raised, and communication is obtained with the bottom. In order to apply the power of the machine to lifting weights, &c., as soon as the machine (which may be moved by the men inside) is moved to the position of a stone, it is affixed to the same, and the supply of condensed air being thrown from the reservoir into the water chambers, and the water being expelled, the machine exerts a force until the weight is overcome. In this way weights of any size may be lifted and transported in the shortest time. Stones of 4 tons have been picked up in 25 ft. water, brought to the surface, moved 30 feet, deposited on the bottom, and a return to the surface made, the whole occupying eight minutes.

Various parties from time to time descended, in 25 ft. of water, all returning highly gratified with the sensations experienced. The fact of practical work being performed at the docks by the workmen of the dock company speaks much in praise of the Nautilus. Practical operations are the test of new principles, and here the proprietors of the Nautilus seem to have been willing to afford every opportunity to criticise its practical adaptability. Most critical examinations were made by the various experienced engineers and practical men who were present, all of whom expressed themselves most favourably, not only as to the principles involved, but as to their mechanical adaptation.

Amongst those present were Mr. G. Parker Bidder (in the chair), Lord Talbot, Sir Morton Peto, Bart., Mr. R. Stephenson, Mr. Joseph Locke, M.P., Mr. Edwin Clarke, Mr. Charles Manby, Mr. Charles Vignoles, Mr. J. Scott Russell, Mr. David Waddington, Mr. Sheriff Mechi and Mr. Under-Sheriff Anderton, Alderman Moon, Mr. Alderman Lawrence, Mr. Alderman Salomons, Mr. Alderman Rose, Mr. Alderman Carter, Mr. M. Marshall, Mr. George Pollard, Mr. W. W. Scrimgeour, Mr. Twining, Mr. R. W. Kennard, Mr. W. A. Wilkinson, Mr. J. P. Gassiot, Mr. Thos. Vardon, Mr. Ford Barclay, Mr. Jeremiah Lodge, Mr. Timothy Tyrrell, Mr. T. R. Winder (superintendent of the Dover Habour of Refuge), Mr. Alfred Clark, Mr. John Murray, Mr. Burgess, Mr. John Hall, Mr. W. D. Cumming, Capt. E. Routh, Mr. Thomas Page, Mr. Robert Hunt, Mr. J. Samuel, Mr. W. B. Adams, Mr. Appold, and several other gentlemen. About 250 sat down to table. The repast having ended, and the loyal toasts been enthusiastically drunk, Mr. Bidder proposed the "Mercantile Marine of England and America, and may each nation strive to excel the other in the advancement of Art and Science." He said he looked upon the important meeting which he was addressing, composed as it almost exclusively was of English engineers and other men of science, congregated together to do honour to the mechanical ingenuity and skill of their American friends, as one of the best and surest proofs of that excellent and cordial feeling which existed between the two nations. (Loud cheers.) They had recently a specimen of the enterprise and mechanical talent of their transatlantic brethren in the appearance of that splendid exhibition of naval architecture, the *Niagara*, which was soon to be eclipsed by the launch of the leviathan, the *Great Eastern*, at Millwall. (Cheers.) He might, however, say he had seen sufficient of the love and prosecution of science by the people of the United States to know that but a short period would elapse before we should have from the other side of the water a vessel in no way inferior to the *Great Eastern* itself. He then proposed the toast, which was drunk with enthusiasm, the whole assembly rising and giving repeated rounds of cheers.

Mr. ROBERT STEPHENSON, M.P., in rising to propose "Prosperity to the Nautilus Submarine Company," was received with enthusiastic cheering, which lasted some time. He said, "Gentlemen: Having heard a very favourable account of the machine, the capabilities of which you have witnessed this day, I felt, and very naturally, great interest in it, because, as I understood, it was applicable to some of the most difficult processes in civil engineering—difficulties with which so many engineers have had to contend. The Nautilus Machine—and I am speaking from personal and careful examination—appears to possess so many qualifications as a diving-bell (a machine which has hitherto been confined to very limited practical operations), that I may truly say it may be called a *universal diving-bell*. (Loud cheers.) I assure you that I could not help feeling very much interested in what had been told me of its usefulness. (Hear, hear.) There are distinct classes of mechanical genius; one distinguished for extreme ingenuity in minute details, applicable to many processes of the highest value in civilised society; but I think the highest class of mechanical talent and genius is brought to bear *in completing those mechanical contrivances that may be called rough and ready machines*. (Loud cheering.) Every mechanic in this room will fully appreciate what I mean. (Renewed cheering.) *I consider this one of such rough and ready machines*, and I must say that the Nautilus Diving-bell appears to me to combine the highest class of mechanical skill with that high class of ingenuity in detail to which I have referred. (Great cheering.) For I must mention to you that the ingenuity brought to bear in Mr. Williamson's pump in the barge, which you must have observed was by a hose connected with the 'Nautilus,' is scarcely second to the comprehensive skill which is evidenced in the arrangements within the bell itself, *and I must frankly say that from the beginning to the end I have never witnessed a piece of mechanism so perfectly adapted to the purposes for which it was designed as the Nautilus Diving-bell and Pump.* (Long-continued cheering.) Gentlemen, with the toast I have proposed you must permit me to couple the names of Mr. Hallett and Major Sears, to whom I consider we are indebted for introducing this remarkable result of mechanical ingenuity and genius. (Loud cheers.) Before I conclude, I think it right I should give you the substance of a statement made in reference to the working of this machine, by the engineer under my friend Mr. Bidder. It appears that great difficulty had been experienced, under the old method, of replacing the heavy iron roller plates for the outer dock gates. The Nautilus was applied to this work, and I have no doubt the meeting will be surprised to learn the fact that *an amount of work which had previously occupied a period of three weeks and four days, was performed by the Nautilus in two days and two hours* with the same number of men employed daily. (Enormous cheering, which lasted for some time.) The engineer reports that he has been down in the Nautilus machine, and is satisfied that by its use nearly the same amount of masonry can be done under water as can be done above the surface." (Great cheering.) He then proposed the toast, which was drunk with three times three and one cheer more.

Mr. HALLETT, in returning thanks, said,—I thank you, I thank you heartily, for the kind manner in which the distinguished gentlemen have been pleased to speak of the Nautilus, and I thank you, gentlemen, for the the cordial manner in which you received it. Justly proud as I am to be an American—proud as I am of the stars and stripes upon the self-reliant breast of an American eagle—I am still more proud to have been instrumental, in any manner, however humble, in introducing an American invention worthy the distinguished character given the Nautilus, by such a man as Robert Stephenson, before whom all others are as pigmies in engineering science—than whom none excel in all the excellencies of public and private life. I am sure more is due to the eminent gentlemen who have honoured us with their company this day for the successful experiments of the Nautilus than to any effort of myself; and I may be allowed to say, that to the directors of the Victoria Dock Company, and to Sir M. Peto, are we indebted for the cordial and liberal facility that has been given for the introduction of the Nautilus in England. Every opportunity has been given us by these gentlemen for extended experiments, and, as has been stated by Mr. R. Stephenson, for the practical working test of a rough and ready American machine. (Loud cheers.) It will be the highest pride of the American proprietors to make the Nautilus worthy the confidence and patronage of the Victoria Dock Company, and of the high character paid it by Mr. Robert Stephenson on this occasion. The Chairman has pronounced the toast, and I am happy to say, as an American, that this sentiment will meet with a warm response in the hearts of my countrymen. (Cheers.) The beauty and the perfection of American marine architecture, and the skill and science of Americans in this profession, have been alluded to, as exemplified in the production of the United States war steamer *Niagara*. I assure you it is with profound pride that Americans look forward to the triumphant accomplishment of her peaceful mission to England, preparatory to performing her part in laying the great submarine telegraph cable which is to connect the opposite shores of England and America. It is a beautiful thought, and as wonderfully comprehensive as beautiful, that within a few months space and time between London and New York will be annihilated, and the two greatest progressive commercial cities of the world will speak to each other with the rapidity of thought. The movements in the London and New York money markets will appear in both countries on the same day they take place. The last division in the British Parliament will be announced simultaneously with the last Congressional vote in Washington. (Loud cheers.) And the same news will be transmitted over 42,000 miles of connecting telegraph lines in the United States, and over 33,000 miles in Europe. Then, I trust, the union and interests of England and America will be one, and that it will be the glory and pride of both countries that America should be considered England's eldest daughter. (Loud cheers.)

Major SEARS said,—Mr. Chairman and gentlemen, for the kind courtesy with which you have received the mention of my name I thank you. The expressions of satisfaction, which I have heard on all sides, with reference to the exhibition of the Nautilus to-day have been most gratifying. The object of the proprietors of this machine has been to perfect, if possible, a machine of practical value for all purposes under water. It has required months and years to overcome all the difficulties in the way. (Hear, hear.) I have been connected with the development of the machine from its incipiency, and must say we have striven hard to construct a machine worthy your approval as practical men. We have sought for the defects and endeavoured to remove them, secure that the advantages would come of themselves. Mr. Stephenson has most happily remarked that the most valuable machines are those which may be styled "rough and ready." It has been our aim to make this of that class. (Cheers.) I can scarcely express the feeling of pride with which I have listened to the opinion expressed by Mr. Stephenson, the greatest of all engineers—the chief of chiefs—the man whose reputation is boundless; for who in all quarters of the globe does not know of his pre-eminence? (Cheers) I would rather have heard the words of approval which fell from him to-day than from any other man living. Gentlemen, it is sometimes said that there is a jealousy existing between our two countries—that we are only willing to see excellencies in our own particular people. This should not be so—indeed, it is not so. Science is of no country, and the only feeling which is admissible is a feeling of generous rivalry, each to excel the other in all things which tend to the advancement of civilisation. Let us know no differences, feel none. The kindly feelings expressed here practically demonstrate that such is the case. Our two countries are now intimately united by bonds of kindred, of friendship, and of commerce; our interests are in common, our destinies the same. (Loud cheers.) Progress is the word, and let us each strive to outstrip the other in the onward race. The gentleman who preceded me referred to closer bonds which are soon to unite us. In a few weeks, by the blessing of Providence, we shall have a stronger holder than now on each other. A great artery, common to both, lying hid midst strong sinews of steel, with lightning power will work every throb through its thousand terminal ramifications, causing its vibrations to be felt in every corner of the two continents—soon, I trust, we may say of the whole world—bearing to each tidings of joy, messages of peace, and of good-will. Standing on the shores of the broad Pacific we will talk with you here; and renew, again and again, the kindest expressions of friendship and regard, and show to the world that in feeling we are but one people. Again, gentlemen, let me thank you for your kind courtesy. (Loud cheers.)

"Prosperity to the Victoria Dock Company" was proposed, and heartily responded to.

Sir MORTON PETO returned thanks, and expressed the pleasure that he and the directors of the company had had in affording those interested in the Nautilus the opportunity of exhibiting its capacity for submarine operations.—Mr. Waddington, Mr. Locke, M.P., Mr. Scott Russell, and others addressed the party, and shortly after six o'clock the numerous guests departed, exceedingly gratified at the novel and successful experiments of the Nautilus.

FURNACES.—Mr. Spencer Smith, Soho, proposes to construct a second or dipping bridge within the furnace, and in advance of the ordinary bridge; such new bridge being reversed or so formed as to project the flame downward, and check it in its passage to the back of the furnace. The new bridge may be made of fire lumps, or in new boilers it may form part of the boiler, being in fact a water space or bridge. In conjunction with the dipping bridge, he also introduces a current of air behind the ordinary bridge, by means of lateral or other openings through the boiler setting, which permits the air to pass into a chamber or space formed behind the ordinary bridge, and gives an inclination to the chamber, or the longitudinal opening therein, by which the current of air is projected at an angle of about 45 deg. into the furnace, or against the dipping bridge. In a boiler 12 ft. long and 3 ft. diameter, the back of the new bridge should be about 9 in. in advance of the ordinary bridge.

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Wm. Orme Carter, Esq., Machno Slate and Slab Company. 145

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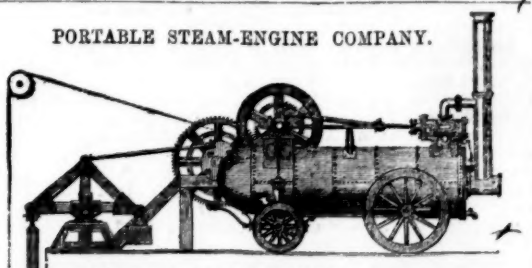

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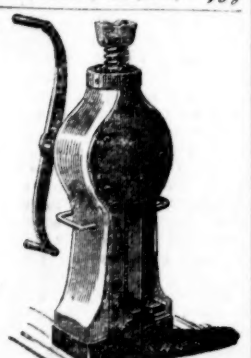

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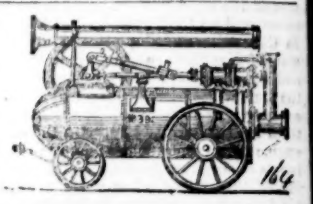

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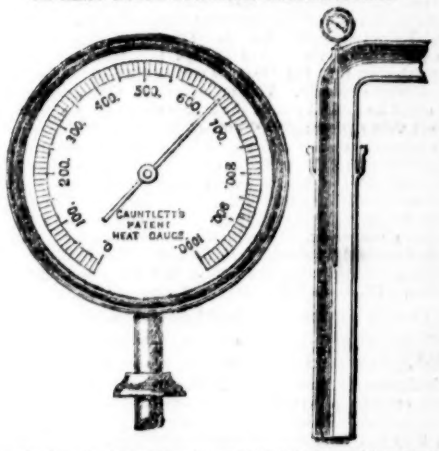

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